

REMARKS*Status of the Claims*

Claims 1-19 were in the application as filed.

Claims 1-2 and 13-14 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,142,069 to Stover (hereinafter, *Stover*).

Claims 3-6 and 15-19 stand rejected under 35 U.S.C. § 103(a) as obvious over *Stover*, as applied to claims 1-2 and 13-14 above, in further view of U.S. Patent 4,142,069 (*sic*, 5,907,685) to Douceur (hereinafter, *Douceur*).

Claims 8-12 stand rejected under 35 U.S.C. § 103(a) as obvious over *Stover* in view of *Douceur*, as applied to claims 3-6 and 15-19 above, further in view of U.S. Patent 6,661,810 to Skelly (hereinafter, *Skelly*).

By this response, claims 1 and 13 are canceled, claims 2, 14 and 15 are amended. Claims 2-12 and 14-19 remain in the application.

Arguments in support of patentability of claims remaining in the application*Rejection of Claims 1-2 and 13-14 Under 35 U.S.C. § 102(b)*

Claims 1-2 and 13-14 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,142,069 to Stover.

With regard to claim 1, Examiner states that *Stover* discloses

a method for determining information at a first network node for adjusting a clock at a selected second network node, the method comprising:

determining an estimate of the offset of said clock at said second node relative to the clock at said first node (*citing to eq. 2, col. 4, line 35*) and

determining an estimate of bias of said estimate of said clock offset (*citing to the estimate of the error in the local clock, col. 12, line 64 to col. 13, line 29*).

Applicants respectfully submit that equation 2, col. 4, line 35 does not reflect an “estimate of the offset of said clock at said second node relative to the clock at said first node.” This offset is reflected more nearly by equation 3 following equation 2. This refocusing on equation 3 is significant because *Stover* discusses the term $(D_{BA} - D_{AB})$ at col. 4 lines 42-55, saying

When the transit times in the two directions are the same, ($D_{BA} = D_{AB}$), they cancel, giving the time difference between the two nodal clocks with the transmission transit times removed. For most applications in high capacity transmission links, this difference in transmission time in the two directions will be very small and could be considered negligible. (If desired, its initial value can be measured by using a portable clock at the time of installation.) However, a statistical estimate of this ($D_{BA} - D_{AB}$) difference can be useful for a time reference distribution system which combines timing information from multiple paths, and it will be discussed later.”

It is submitted that this later discussion is that presented at cols. 12 and 13 cited by Examiner. In other examples, Stover appears to assume that $D_{BA} = D_{AB}$ and any bias associated with differences in transmission times for opposite directions is “negligible.”

In any event, Examiner asserts that applicants’ step of “*determining an estimate of bias of said estimate of said clock offset*” is shown in Stover as “the estimate of the error in the local clock” – citing to col. 12, line 64 to col. 13, line 29 in Stover. This assertion, it is respectfully submitted, is incorrect because the “error in the local clock” said by Examiner to be described in Stover at col. 12, line 64 through col. 13, line 29) is the “offset” recited in the first step of claim 1. That is, the estimate in the first step of claim 1 is an estimate of the difference between the clock at the first and second clocks, *i.e.*, an estimate of the error at the second clock relative to the first clock. The estimate in the second step of claim 1 is an estimate of “bias” of the estimate of “offset” of the first step of claim 1. So, the second step of claim 1 deals with the reliability of the estimate of the estimate in of offset in the first step of claim 1.

As is known generally, “bias” is associated with the presence or not of some factor that affects the results in a consistent or systematic way. See, for example, the distinction between error arising from sampling errors and systematic “bias” discussed at <http://www.stats.gla.ac.uk/steps/glossary/sampling.html#bias> (copy attached). See also, <http://planetmath.org/encyclopedia/AsymtoticallyUnbiasedEstimator.html> where “bias” is defined as:

Definition. If θ is a parameter in a statistical model, the bias of an estimator $\hat{\theta}$ of θ , is the difference between expectation of $\hat{\theta}$ and the value of θ , which, by abuse of notation, is also denoted θ :

$$\text{Bias}(\hat{\theta}) := E(\hat{\theta}) - \theta.$$

An estimator is called an *unbiased estimator* if its bias is zero at *all* values of θ . Otherwise, it is a *biased estimator*.

Note that the random error does not appear in the above definition because its expectation is zero.

The term “bias,” as used (or observed and assumed) by Examiner in the present rejection of claim 1, obscures the difference between “bias” and “offset.” In any event, Stover does not teach determining “bias,” as used in the second step of applicants’ claim 1. In particular, Examiner equates applicants’ step of “determining an estimate of bias of said estimate of said clock offset” with Stover’s [determining of] “the estimate of the error in the local clock” (citing to Stover’s col. 12, line 64 to col. 13, line 29). [An alternative reading of Examiner’s comment associated with the second step of claim 1 is that Examiner did not consider “bias” as anything different from offset. Bias is clearly not the same as offset, as noted, and Examiner’s comment is not apposite to the whole of the second step of claim 1. That comment is therefore inadequate to support the rejection.]

To expedite prosecution and without prejudice to remaining claims, claim 1 has been canceled in favor of presently amended claim 2. As amended, claim 2 includes all limitations of claim 1, and all of the arguments made in response to the rejection of claim 1 apply to claim 2 (amended). Further, claim 2 (amended) includes language based on its original recitation that “said determining an estimate comprises exchanging a plurality of rounds of ordered time-stamped messages between said first node and said second node.” In particular, amended claim 2 makes crystal clear “said determining an estimate of the offset and said determining an estimate of bias each comprising exchanging a plurality of rounds of ordered time-stamped messages between said first node and said second node.”

Thus, in support of the patentability of claim 2 (presently amended), applicants submit that Examiner does not cite any teaching or suggestion in Stover that includes applicants’ steps incorporated from claim 1, now comprising “exchanging a plurality of rounds of ordered time-stamped messages between said first node and said second node.” This failure of a corresponding teaching in Stover is especially clear in respect of applicants’ “determining an estimate of bias comprising exchanging a plurality of rounds of ordered time-stamped messages between said first node and said second node.” At most, Stover describes at col. 12, lines 45-64 that

Also, a transmission link will contribute an error to the measured difference between the clocks at the two ends of the link. This error is due to differences in propagation time in the two directions, time delay differences in the transmitters and receivers at the two ends of the link, and errors contributed by the measurement equipment. This measurement error introduced by a transmission link can be assumed to come from an ensemble with a Gaussian distribution having zero means and variance σ^2 , where σ^2 depends upon the properties of the medium and the characteristics of the equipment at the two ends of the link. During system design an estimated value of σ^2 is assigned to each transmission link based on system engineering factors.

Importantly, Stover does not perform “exchanging message a plurality of rounds of ordered time-stamped messages....” for determining an estimate of bias of said estimate of said clock. Instead, a value of σ^2 is said to be assigned based on system engineering factors. The comment in Stover relating to error resulting from differences in propagation time in the two directions recited above, and an estimate for this error is described at col. 12, lines 48-57. Moreover, this source of error is only one of the factors giving rise to errors contributed by the transmission link. No assertion of “bias” of offset estimates is made by Stover. Moreover, the TRDVSN approach described the Examiner-cited (and other portions) of cols. 11, 12 and 13 involves exchange of information with “neighbors” having specific link relationships to a master and the local node being the subject of clock accuracy testing. In short, Stover does not perform the step of “exchanging a plurality of rounds of ordered time-stamped messages” between applicants’ first and second nodes for “determining bias in an estimate of offset of said clock at said second node relative to the clock at said first node.”

Applicants respectfully submit that the basis for rejection of claim 2 in Examiner’s remarks is not correct. Equations cited by Examiner do not assert or imply a teaching by Stover of “exchanging a plurality of rounds of ordered time-stamped messages” between applicants’ first and second nodes for “determining bias in an estimate of offset of said clock at said second node relative to the clock at said first node.” The operation of equations 1 and 2 do not describe or imply such an exchange for the purpose recited in claim 2 (amended). As noted above, the only technique cited by Stover regarding a value for (composite) transmission link variation is arrived at by “During system design an estimated value of σ^2 is assigned to each transmission link

based on system engineering factors.” (Emphasis added.) (Stover, col. 12, lines 46-59.) In particular, there is no showing in Stover of a sequence of messages as recited in claim 2 (amended) for achieving the estimates made in that claim.

For the foregoing reasons, it is submitted that claim 2 (amended) is not anticipated by Stover.

Again to expedite prosecution, and without prejudice to remaining claims, claim 13 has been canceled in favor of amended claim 14. Comments presented above in support of patentability of claim 2 are also applicable to the patentability of claim 14.

In respect of the rejection of claim 13, now incorporated in claim 14 (amended), Examiner cites to Stover at col. 16, line 60 through col. 17, line 45. In Stover’s Table 2 at the top of col. 12, Rule 3 is recited. This Rule 3 is referred to at col. 16, beginning at line 60. In that portion of Stover, the above assumption of $D_{BA} = D_{AB}$ is again recited. This establishes that equation 3 can be used without employing either of the terms D_{BA} or D_{AB} . Rule 5A deals with Item 4 of Table 2 and requires use of differences between the local clock and each neighboring node. This has nothing to do with applicants’ claimed invention.

Rule 6A of Stover at col. 17 employs an “estimated inaccuracy” that does not correspond to “bias” or any other aspect of applicants’ claimed invention. Stover’s Rule 6A includes “[f]or each neighboring node, this information is added to the estimated inaccuracy (stated as variance) contributed by the path between the neighboring node and the local node as determined during network design.” This clearly is not the same as any aspect of either applicants’ claim 2 (amended) or 14 (amended) in which “exchanging a plurality of rounds of ordered time-stamped messages” between applicants’ first and second nodes for “determining bias in an estimate of offset of said clock at said second node relative to the clock at said first node” is recited.

Stover’s Rule 7A at col. 17 involves selecting “inaccuracies” involving “neighbors” having fewer links between themselves and the master than the local node has between itself and the master. Such selection of inaccuracies” associated with particular nodes is clearly not the same as “exchanging a plurality of rounds of ordered time-stamped messages” between applicants’ first and second nodes for “determining

bias in an estimate of offset of said clock at said second node relative to the clock at said first node.”

After deriving the value E in accordance with equation (6), this information is provided by the local node to all neighbors.

Overall, then, it is clear that the cited portions of Stover at cols. 16 and 17 do not correspond to applicants’ claim 2 (amended) or 14 (amended) in which “exchanging a plurality of rounds of ordered time-stamped messages” between applicants’ first and second nodes for “determining bias in an estimate of offset of said clock at said second node relative to the clock at said first node” is recited.

For the above reasons, it is respectfully submitted that claim 14 (presently amended) is patentable over Stover.

Rejection of Claims 3-6, 8-12, and 15-19 and Under 35 U.S.C. § 103(a)

Claims 3-6 and 15-19 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Stover as applied to claims 1-2 and 13-14 and further in view of Douceur.

Initially, since claims 2 and 14 are, it is submitted, patentable over cited art for the reasons stated above, and since claims 3-6, 8-12 and 15-19 depend from either claim 2 or claim 14, it is submitted that claims 3-6, 8-12 and 15-19 are patentable as well.

It is asserted by Examiner with respect to claims 3-4 that though Stover does not specifically disclose sending one message containing specific timestamp information for the messaging between the first and second node, but only discloses D_{AB} . Douceur is asserted to show that multiple time stamps can be used to send arrival and sending times between two nodes.

Douceur teaches techniques intended for synchronization purposes in a *communications ring*. There is no teaching of communications from other than adjacent nodes in a ring. This is in contrast to the teachings of Stover with which Examiner proposes to combine teachings with those of Douceur. It is clear that the “neighbor” nodes of Stover, having a prescribed relationship with a master node, have no counterpart with the quite differently structured node structure of Douceur. There is no reason for expecting teachings relating to hierarchical node structures (Stover) to apply to the ring architecture of Douceur. Thus, there is no reason to find that it would be obvious to

combine teachings on the specific point of message content in two such disparate systems.

Moreover while both Douceur and Stover (and not the presently claimed invention) involve message exchanges between other than nodes applicants' claimed "first" and "second" nodes, Douceur only allows passage of messages around the communications ring, receiving from one node and transmitting to another (different) node. Douceur's nodes only communicate in a one-way direction, so there is no "exchanging a plurality of rounds of ordered time-stamped messages between said first node and said second node" as recited in claims 2 and 14."

For these reasons, Douceur and Stover in combination do not anticipate or render obvious the subject matter of claims 3 or 4.

Claims 5 and 6 depend from claim claims 3 and 4 and so are patentable for the same reasons as claims 3 and 4. Moreover, the relationships expressly recited in these claims is neither found nor suggested anywhere in either Stover or Couceur or any combination of their teachings. Contrary to Examiner's assertion, the variables and other operands in the equations of claim 5 are not found for the i th round of messages between a first and second node as in claim 5. Equation (6), for example is a composite error for n parallel paths including the above-described "system design" estimates (Stover, col. 12, lines 57 through col. 13, line 29) – not the result of rounds of messages between applicants' first and second nodes.

Claim 15-19 depend from claim 14 (presently amended) and are patentable for the same reasons as claim 14 (presently amended), notwithstanding Examiner's bases for rejection over any of the references of record or any combination of such references.

Claims 7-12 depend from one or more of claims 2 (presently amended) through 6 and are patentable for the same reasons as the claims from which they depend, notwithstanding Examiner's bases for rejection over any of the references of record, or any combination of such references.

References cited, but not applied, have been reviewed and found not to be any more relevant than the references presently applied - either alone or in combination with themselves or the references that were applied.


Conclusion

For the foregoing reasons, it is respectfully submitted that claims 2-12 and 14-19 remaining in the application, as above amended, overcome or avoid all bases for rejection and are allowable. It is requested that all claims be further examined, found allowable and passed to issue.

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